

POWERLINE

The Voice of the On-Site Power Generating Industry

July/August 2008 \$5.00

Electrical Safety

New Changes to NFPA 70E

EGSA News

• *Coren Scholarship Winners
Named for 2008-2009*

Emergency Power

Medical Center Case Study

Emissions

Reducing CO and PM
from Engine Exhaust



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Sound attenuation and customized switch-gear helped make this medical center project a success; page 27.

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Conferences

EGSA 2008 Fall Technical & Marketing Conference

September 7-9, 2008; Atlanta, GA

Speakers will cover business and technical aspects of On-Site Power Generation and current industry trends. For information, visit www.EGSA.org or call (561) 750-5575.

EGSA 2009 Annual Spring Convention

March 15-17, 2009; San Antonio, TX

The Association's Annual Convention of Members. Speakers will cover business and technical aspects of On-Site Power Generation and current industry trends. For additional information, visit www.EGSA.org or call (561) 750-5575.

EGSA 2009 Fall Technical & Marketing Conference

September 13-15, 2009; Colorado Springs, CO

Speakers will cover business and technical aspects of On-Site Power Generation and current industry trends. For information, visit www.EGSA.org or call (561) 750-5575.

Industry Trade Shows

The Diesel Progress On-Line Show

September 24, 2008 to March 24, 2009

The annual Diesel Progress On-Line Show highlights the products, technologies and industry news of all the engine-powered equipment and component markets and will be co-located with the September issue of *Diesel Progress* magazine. Open 24-7

during its six-month run, it features updated information on new products, news events and video. For more information, visit www.dieselpub.com.

POWER-GEN International 2008

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Schools

EGSA On-Site Power Generation Advanced Schools

Austin, TX.....Oct. 20-23, 2008

EGSA On-Site Power Generation Basic School

Orlando, FLDec. 3-5, 2008*

*To be held concurrently with POWER-GEN International

The most complete overview of an On-Site Electric Power Generation System available anywhere today. Now offering Continuing Education Units (CEUs)! For information, visit www.EGSA.org or call (561) 750-5575.

Look for more industry events in our up-to-date calendar on the web at www.EGSA.org. EGSA Members: To list your meetings here, fax your information to (561) 395-8557.



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Warner Bauer
2008 EGSA President

The Need for On-Site Power

Recent events in China and Burma have really brought home the importance and need for reliable, accessible emergency power. It's unsettling to see just how much we rely on easy access to power and how easily that access can be blocked by acts of nature.

Burma suffered badly under Tropical Cyclone Nargis. Over 75,000 people were killed and an estimated 2.4 million are now homeless. The cyclone knocked out power and water supplies, felled trees and damaged hundreds of buildings in Rangoon. Three weeks after the event, the BBC reported that authorities were still working to restore basic services and to reach survivors in the Irrawaddy Delta. The lack of power has complicated efforts to assist survivors; many health centers have been destroyed and water supplies have been contaminated.

One might chalk up such wide scale destruction to Burma's lack of infrastructure. However, China suffered just as badly in its recent earthquake. The resulting destruction is spread across a very heavily populated area that some say is as large as France. China's news agency Xinhua has reported that nearly 70,000 people were killed and millions have been left homeless. Here, too, authorities are struggling to reach survivors, supply aid and secure food and water supplies.

Clearly, nature does not discriminate when it comes to natural disasters. Both countries could have reaped short term benefits from emergency power (and may very well have done so).

On this side of the Pacific, our needs are currently focused on clean, renewable energy in the

face of rising fuel prices. Over the past three decades, our society's appetite for power has been growing at an exponential rate. We're attached to our toys—our big screen plasma televisions, our DVD players and CD stereos and, of course, a wide and bewildering array of household goods and appliances. In short, when you add up the luxuries we enjoy and the things we consider necessary, our energy needs are pretty significant.

Technological advances resulting in greater energy efficiency take the edge off our power appetite but they do not go far enough. Sooner or later the national power grid will either require large infusions of capital for redevelopment or it could very well collapse under its own weight.

Reliable standby power is no longer a "luxury" or something exclusively directed at keeping the elevators running. It is absolutely essential to the success of any business today—especially those businesses who rely on instant access to data. Few data centers, for example, could hope to survive a major catastrophe without an essential portfolio of redundant power systems and components, fuel systems, automatic transfer switches and uninterruptible power supplies (UPS).

All of this adds up to a compelling argument for On-Site Power. Manufacturing plants, business and homes can enjoy a greater measure of self-sufficiency and security with On-Site Power. Add in the "green" factor and the benefits and payback are even greater. Yes, the economy is flagging. However, it appears that our industry may be headed in the right direction. ■

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George Rowley
EGSA Director
of Education

Reference Book Update

In my last column I mentioned that you would have received the Call for Authors and Reviewers for the new edition of our *On-Site Power Reference Book* by the time you had received that issue of *Powerline*. Unfortunately (and fortunately) we discovered a few issues that needed to be resolved before issuing the Call. It is hoped that you will have received it by the time you read this and that our delay has not been an inconvenience.

We can realize our plans and goals for the book only with your help. Whether we reach our goals for the many improvements is contingent upon identifying and recruiting qualified authors to write the chapters and to identify reviewers that can help ensure that all appropriate content has been included and that it is accurate. And that is where you come in—volunteer to serve as an author, co-author or reviewer or make a referral of those you know who have the knowledge, experience, and expertise to make a contribution.

Responding to the Call is your chance to impact the industry in a way that will last for years. And to make this valuable resource even better than in the past, we need your help. We seek Authors

and Reviewers for the upcoming new Edition of the industry bible: *On-Site Power Generation: A Reference Book*. Participation as an author, a co-author or as a reviewer is a great way for you to make an important contribution and to obtain recognition of your knowledge and expertise.

As mentioned in previous columns, we plan many improvements to the new edition. In addition to updating every chapter, several new chapters will be added, several chapters will be combined and many chapters will be reconstituted through the addition of new topics. We also plan

to have the book professionally indexed and we will determine if color graphics are economically feasible.

Technician Certification Update

The Technician Certification Program continues to gain momentum. As of the end of May there were 206 certified technicians! The number of tests sold in the first 5 months of this year (86) is closing in on the total sold for 12 months last year (103). The number of technicians taking the test in April (24) was an all-time high followed closely by the 23 that took the test in May. And in April, seven more Canadian technicians passed the test bringing the total of EGSA Certified Technicians in Canada to 13.

IMPORTANT! Marketing Focus is Shifting

While we are pleased with the acceptance of the Certification Program, the Certification Committee and EGSA Board of Directors feel that a more assertive marketing program is warranted. As mentioned in my last column, we are beginning to shift the focus of our marketing efforts. We recently sent RFPs to a number of marketing/communications firms and, if a response to the RFP is accepted and approved by the Board, we may engage the services of a professional communications company to develop and implement a comprehensive marketing program. Many feel that the primary focus of our marketing program should be End-users.

As our first step in shifting marketing focus, we recently sent a postcard to Distributor/Dealers and selected Manufacturer members. You will see a sample of the postcard cover at left on this page. Inside, the postcard presents the following theme: There are those who make it happen, those who watch it happen, and those who wonder what happened. Which are you? Raise the standard. Leap ahead and Make it Happen!

Questions or comments about EGSA Education programs should be directed to George Rowley, EGSA Director of Education (G.Rowley@EGSA.org or 561/237-5557). ■

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Stand out from the Competition with the EGSA Certified Electrical Generator Systems Technician Logo

You can now wear this patch! It is used only by EGSA Certified Technicians. It sends a clear message that you and your employer are special. It shows you have proven your skill and knowledge by passing a rigorous test and that your employer is committed to excellence and high standards. If you've earned the title "EGSA Certified Electrical Generator Systems Technician"—use this logo with pride!



EGSA Member Item # (Specify)	Non-Member Item # (Specify)	Quantity	Logo Item Description	EGSA Member Price	Non-Member Price	Item Total
<input type="checkbox"/> FSU 093	<input type="checkbox"/> FSU 094		Logo Uniform Patch —These highly detailed uniform patches contain over 15,000 stitches to highlight our copyrighted line drawing genset logo and proclaims, in gold lettering, that the wearer is an "EGSA Certified Electrical Generator Systems Technician."	<input type="checkbox"/> \$3.50 (Purchase limited to 5 per technician)	<input type="checkbox"/> \$6.50	
<input type="checkbox"/> FSU 120	<input type="checkbox"/> FSU 121		Baseball Cap —These distinctive EGSA blue caps with white brim stripe, button, and vents feature the EGSA Certified Electrical Generator Systems Technician logo in front. These one-size-fits all caps are made of durable high-quality cotton and feature a flex-strap to adjust the size.	<input type="checkbox"/> \$21.25 (Purchase limited to 5 per technician)	<input type="checkbox"/> \$26.25	
<input type="checkbox"/> FSU 122	<input type="checkbox"/> FSU 123		Self-Adhesive Decal (4"x6") —These heavy-duty adhesive-backed vinyl decals are made to hold up to exposure to the elements. To help resist fading and weathering, the images are printed with UV-resistant ink and we have applied an extra coating to further protect the image from fading and abrasion.	<input type="checkbox"/> \$10.75 (Purchase limited to 5 per technician)	<input type="checkbox"/> \$15.75	
<input type="checkbox"/> FSU 124	<input type="checkbox"/> FSU 125		Self-Adhesive Decal (8"x10")	<input type="checkbox"/> \$21 (Purchase limited to 5 per technician)	<input type="checkbox"/> \$25	

Only EGSA Certified Technicians are authorized to use Certified Technician Logo Items. Please enter the technician's certificate number so that we can process the order

EGSA Certification Number

Sub Total

Electrical Generator Systems Technician Certification Logo Items Order Form

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Herb Whittall
EGSA Technical Advisor

New ISO Document Published

The following ISO document was published and is now in effect: ISO 8178-2:2008 – Reciprocating internal combustion engines – Exhaust emission measurement – Part 2: measurement of gaseous and particulate exhaust emissions under field conditions. This standard is available from the ANSI eStandards Store at webstore.ansi.org or through ANSI Customer service at the following address:

ANSI
Attn: Customer Service Dept., 4th Floor
25 W 43rd St., New York, NY 10036

UL News

UL has proposed the following revisions to UL 2200 – Standard for Stationary generator Assemblies:

- Adding a test to address weather protection.
- Adding marking requirements for LPG and natural gas fueled generators.
- In paragraph 2.6 changing “ironically” to “ionically”.

UL has opened a proposal for new and revised requirements for UL 60950-1 Ed.2. *Information Technology Equipment-Safety-Part 1* in the UL Collaborative Standards development System (CSDS). Changes to this standard may affect UL 60065 Ed 7 and UL 1778 Ed 4 *Standard for Uninterruptible Power Systems*.

UL announced the resolution for work area notices for UL 1012 Ed 7 – Standard for Power Units other than Class 2. The resolution was to proceed with preliminary review on the following 9 topics:

1. Revisions to requirements for power supplies for use by travelers.
2. Clarification of requirements for output connectors.
3. Addition of requirements for modular units.
4. Exclusion of sheet metal screws for connection of grounding conductors.
5. Output alternating current power circuit overcurrent protection.
6. Measured input current when temperatures stabilize.

7. Requirements for output wiring and supply connections for outdoor use.
8. New requirements for foreign voltage adapters.
9. Editorial revisions including cross reference corrections and updated references.

Voting Open on ISO Documents

Voting opened on the following ISO documents and closes on September 1, 2008. If you would like to comment on these documents, contact me at h.whittall@comcast.net. They are:

- ISO7967 Reciprocating internal combustion engines – Vocabulary of components and systems.
Part 4 – Pressure charging and air-exhaust ducting systems.
Part 6 – Lubricating Systems.
Part 7 – Governing Systems.
- ISO8528 Reciprocating internal combustion engine driven alternating current generating sets.
Part 4 – Controlgear and switchgear.
Part 6 – Test methods.

Voting opened the same day on ISO8528 – 2 Reciprocating internal combustion engine driven generating sets – Part 2 – Engines. The closing date for this standard was May 29, 2008.

Florida Updates Building Code

On October 1, 2008 Florida will adopt the latest Florida Building Code developed by the International Code Council. The ICC has a pamphlet detailing the changes from 2004. They are #7040S07 for commercial and #7041S07 for residential and cost \$44 each.

The IEEE and NFPA have a joint study going on concerning arc-flash to enhance worker safety through improved Codes and Standards. ■

Faults Happen

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To learn more about Lean Electrical Control, visit www.lean-electrical-control.com/47 to download your FREE copy of ABB's whitepaper, "10 Steps to Lean Electrical Control".

EGSA Names David I. Coren Scholarship Recipients for 2008-2009 Academic Year

The Electrical Generating Systems Association (EGSA) Scholarship Committee recently completed its review of credentials and ranking of applications for scholarships for the 2008-09 academic year. Per the EGSA Board of Directors' action at its Spring meeting, the committee further decided to award twelve \$2,500 scholarships.

The following students have been named as recipients of the David I. Coren Memorial Scholarship Awards for the 2008-2009 academic year:

- Patrick R. Hartung, Fox Valley Technical College
Degree/Major: AAS/Diesel Technology and EPG
- Kathryn A. Illum, Idaho State University
Degree/Major: AAS/Energy Systems Inst & Control Engineering Technician
- Andrew D. Kleckner, Universal Technical Institute
Degree/Major: Certificate/Electric Power Generation
- Wade A. Kuhl, Fox Valley Technical College
Degree/Major: AAS/Electric Power Generation
- Matthew C. Loucks, Ohio Technical College
Degree/Major: Certificate/Electric Power Generation

- Clifford G. Milner, Clemson University
Degree/Major: BS/Mechanical Engineering
- Jacob D. Schaeffer, Pennsylvania College of Technology
Degree/Major: AAS/Diesel Tech/EPG
- Kenneth C. Schmitgal, Ferris State University
Degree/Major: BS/Heavy Equip. Svc. Eng. Tech
- David M. Vander Ark, North Dakota State University
Degree/Major: BS/Electrical Engineering
- Robert W. Wagner, Universal Technical Institute
Degree/Major: Certificate/Electric Power Generation
- Diana C. Wiener, Ohio Technical College
Degree/Major: Certificate and AAS/Diesel & Electric Power Generation
- Shane P. Wilcome, Ferris State University
Degree/Major: BS/Heavy Equip. Svc. Eng. Tech

The David I. Coren Scholarship Program provides financial assistance to qualified students and is designed to have a positive impact on personnel shortages in our industry and will be an excellent vehicle for enhancing awareness of the industry.



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Twelve \$2,500 scholarships have been awarded for the 2008-2009 academic year. The competitive, merit-based scholarships are awarded to qualified students who plan on pursuing a career in the On-Site Power industry. In addition to their career focus, applicants must be full-time students, have a declared major related to On-Site Power, and maintain a minimum 2.8 GPA.

EGSA launched the David I. Coren Scholarship Program in 2002 to promote awareness of the On-Site Power Generation industry and to generate interest in On-Site Power careers. The move came in response to the growing need for skilled On-Site Power personnel. While the Association has an established and widely recognized On-Site Power School education program of its own, the Board of Directors noted the industry's need for individuals with higher

educations from a variety of applicable disciplines.

Information detailing the David I. Coren Memorial Scholarship program—including a Scholarship Program Brochure and an Application Packet—is available on the Association's web site at www.egsa.org. For additional information, individuals may contact George Rowley, EGSA Director of Education, by e-mail at g.rowley@egsa.org or by phone at 561-237-5557. ■

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 I N N O V A T I O N S

Reducing Carbon Monoxide and Particulates from the Exhaust of Stationary Engines

By Michael J. K. Pope, Süd-Chemie Inc.

There are just three areas of influence that control the exhaust emissions from reciprocating internal combustion engines: fuels, combustion and post combustion technologies. Let's start with fuels.

It is difficult to attain clean exhaust with dirty or low-quality fuel. Ingredients in fuels can reduce or limit the effectiveness of post combustion devices. For example, new automobile emission regulations followed the Clean Air Act of 1970 requiring the use of catalysts. The lead additive in gasoline had to be removed in order for the catalyst to operate without getting covered and rendered useless. Similarly in 2006, Ultra Low Sulfur Diesel (ULSD) was introduced to the U.S. to increase the effectiveness of the exhaust after-treatment devices on highway trucks and passenger cars.

Development of cleaner fuels continues, particularly for compression ignition engines. As the cost of petroleum fuels continues to rise and is likely—at some point—to stabilize at a high level, other fuel options become more competitive than before. The conversion of gas to liquid (GTL) and coal to liquid (CTL) and Canadian tar sands is more viable.

A bi-fuel system, where natural gas is premixed with intake air on diesel gensets, is becoming more popular, since it can reduce particulate matter and hydrocarbons. NOx may also be reduced, but carbon monoxide emissions will increase.

Biodiesel can also contribute to emission reductions, especially of particulate matter and hydrocarbons. However, there are many different sources (soy, rapeseed, sunflower seed, used cooking oils, etc) with different properties. So far, most engine manufacturers have been reluctant to permit more than a B5 (95% petroleum diesel, 5% biodiesel) due to concerns including cold temperature storage and engine starting, effects on seals and fuel hoses and a lack of standards. And there is growing concern about the competition with food production. A few manufacturers have ex-

tended to B10 and B20. Expect more development with these fuels.

Combustion

Fuel (hydrocarbons) is injected or drawn into the combustion chamber just before top dead center for the piston on the compression stroke. The air/fuel mixture either spontaneously ignites due to the high temperature after being compressed or a sparkplug creates a high voltage arc that ignites the mixture. At the high temperatures and pressures of combustion, the fuel, air and a small amount of lube oil undergoes a chemical change.

Most of the exhaust volume is completely harmless to humans—oxygen (O₂), nitrogen (N₂), carbon dioxide (CO₂) and water (H₂O). The remainder, about 1%, comprises some major pollutants which are regulated by Federal and/or State and local agencies. The important regulated pollutants are:

- NOx—Nitrogen Oxides formed by a reaction between nitrogen and oxygen at high combustion temperatures. NOx reacts with volatile organic compounds (VOCs) in the presence of heat and sunlight to form ozone. It causes acid rain. 45% of NOx comes from mobile sources, 35% from electric utilities and 15% from industrial fuel combustion. Our power generation industry is included in this last category.
- CO—Carbon Monoxide—formed at the intermediate stage of combustion due to incomplete combustion. Highly toxic.
- HC—Hydrocarbons are elements of unburned fuel caused by low combustion temperature and/or poor air/fuel mixture. Contributes to smog and breathing ailments.
- PM—Particulate Matter (also referred to as soot) consists of a core of carbon (<10 microns). Poisonous hydrocarbons from combustion condense on

the surface of this core. When inhaled, particulates may attach to the lining of the lung and lead to breathing ailments such as asthma and may cause cancer.

- HCHO—Formaldehyde—contributes to smog; a carcinogen.

One dilemma faced by combustion engineers is that the logical solution to reduce NOx is to reduce the temperature of combustion. However, that will increase the level of HCs produced so a reasonable compromise has to be reached.

Engine manufacturers have achieved huge reductions in exhaust emissions since the EPA's Tier 1 standard was introduced. The new technologies include:

- Cross flow cylinder heads for better thermal efficiency.
- Exhaust gas recirculation (EGR) to reduce NOx.
- Variable geometry turbo-chargers.
- After-coolers for the intake air (thermal efficiency again).
- Electronic fuel injection.
- High injection pressures (presently up to 33,000 psi, *ten times higher* than 15 years ago) for better atomization of the fuel.
- Common rail fuel systems.
- Multiple injection events during the combustion process.
- Electronic engine management controls.

The most significant advancement has clearly been the introduction and development of the electronic engine management system and electronic injectors.

These improvements, driven by the increasingly stringent Federal emissions standards, have increased the thermal efficiencies of most production engines to over 40%. Just two decades ago only about 33% of the fuel energy going into an engine was converted into power at the flywheel. The remaining energy was converted to heat and wasted through the exhaust and cooling system. Today engine manufacturers

are exceeding 45% thermal efficiencies in their labs and 50% is very likely achievable. Capture and use the exhaust and jacket heat (cogeneration or Combined Heat and Power (CHP)) and the thermal efficiency will go to well above 80%.

It is a chemical certainty that when atomized diesel fuel or natural gas is ignited (at 15 “events” per second at the synchronous speed of 1800 rpm) the subsequent combustion and energy release will result in several consequences:

1. The energy contained in the fuel rapidly converts to heat energy and increases in volume, forcing the piston down to turn the crankshaft (mechanical energy which is then converted into electrical energy by the generator).
2. The high temperatures at the flame tips create nitrogen oxides (NOx).
3. Incomplete combustion in some areas of the combustion chamber create carbon monoxide (CO).
4. The relatively cool areas in the combustion chamber—cylinder walls, inlet valve(s)—also lead to incomplete combustion and create hydrocarbons (HC) and particulate matter (PM).

All engine manufacturers and many research organizations are using huge resources to reduce the creation of these pollutants during combustion. There is continuing evolution of the present strategies—fine tuning the intake, combustion and exhaust systems including exhaust gas recirculation, as well as reducing internal friction and accessory drives. Research is progressing on some interesting new technologies such as Homogenized Charge Compression Ignition (HCCI) in which atomized diesel fuel is injected into the inlet ports before the inlet valve. Spontaneous combustion without hot flame tips reduces NOx creation.

Post Combustion Technologies

Exhaust after-treatment devices can reduce the engine out emissions to negligible amounts. The most common device used is, of course, the **Catalyst**. Most common pollutants can be eliminated at very high temperatures, say 2,000°F. The catalyst achieves the same thing at normal engine exhaust temperatures (400-1,200°F). It causes a chemical reaction and change without changing itself or being consumed in the process, which is very convenient

for us. We know from our cars that the catalyst is generally trouble free and lasts for hundreds of thousands of miles without maintenance or repair.

A catalyst is comprised of a carrier or **substrate** which can be made of a metal foil or extruded ceramic with a honeycomb cross section. They can be almost any shape but the most common are round with diameters up to about 3 ft, 3.5” wide. They can also be rectangular and are used for large applications such as gas turbines.

Catalyst manufacturers first apply a “**washcoat**” to the substrate. This starts out as an alumina slurry and its purpose is to first provide an effective bonding surface and second, to microscopically increase the surface area of the substrate. The greater the surface area, the more effective the catalyst will be.

After the washcoat has been applied and cured, **precious metal(s)** are applied. These are Platinum Group Metals (PGM) which include platinum (Pt), palladium (Pd) and rhodium (Rh). “Noble” is another term used for these metals. Any combination and loading (g/ft³) may be used, depending on the mission of the catalyst and the chemistry required to get there. Catalyst manufacturers, like the engine builders, are always researching the chemistry to improve performance and reduce the volume of these very expensive metals.

For the purposes of this discussion, we will divide the technologies into two groups:

- A. Rich Burn Engines: These have less than 0.5% of O₂ (oxygen) in the exhaust stream—gasoline and many natural gas engines are in this category. Typically there is a carburetor or throttle body restricting the inlet air into the combustion chamber and most of the O₂ is consumed during the combustion process. The gasoline engines in our automobiles are rich burn engines.
- B. Lean Burn Engines: The diesel engine and many natural gas engines are in this category—there is little or no restriction on the amount of air that goes into the combustion chamber, resulting in more than 5% oxygen (O₂) in the exhaust stream.

If all of the O₂ and all of the fuel are consumed the condition is known as **stoichiometric**: technically perfect combustion.

The selection of after-treatment devices

depends on whether the engine is rich or lean burn.

Solutions for Rich Burn

Non Selective Catalytic Reduction (NSCR), commonly known as the 3-way catalyst, is chemically very clever. Remember, there is only about 0.3% O₂ in the exhaust stream. The catalyst reduces the NOx to N₂ (nitrogen) and O₂. Now the catalyst can use that O₂ to oxidize the CO and NMHC in the same way as a regular oxidation catalyst.

Conversion ratios of >99% of NOx and CO are attainable. And again, 95% of the NMHC goes away.

The trick with rich burn engines is to get the air/fuel ratio just right. Too much O₂ and the NOx will not all get reduced; not enough O₂ and the CO cannot get oxidized. Fortunately, several manufacturers make very effective air/fuel ratio controllers (AFRC) which constantly monitor the situation with O₂ sensors and automatically make the necessary adjustments.

Solutions for Lean Burn

1. NOx can only be reduced. It cannot be oxidized by a catalyst. The most effective technology for NOx reduction under these conditions is **Selective Catalytic Reduction (SCR)**, a system that injects urea or ammonia (known as the *reductant*) in front of ceramic blocks. The ammonia reacts with the NOx and reduces it to N₂ and CO₂. An SCR system can reduce NOx emissions by up to 98%. This technology is presently the most efficient method of reducing NOx from lean burn engines and is widely used on diesel passenger cars, trucks and large stationary gas and diesel engines. SCRs are beyond the scope and space available in this article, but there is a section on SCRs in the *On-Site Power Generation—A Reference Book*, 4th Edition, Chapter 38, Page 519.
2. CO and NMHC emission levels are easily reduced with an oxidation catalyst. The efficiency of reduction depends on the exhaust temperature and flow rate, volume of catalyst and, of course, the catalytic formulation. CO can be reduced to levels that are barely traceable and the NMHC to about 95%, depending on the exhaust temperature. It is important to note that the oxida-

Reducing Carbon Monoxide and Particulates

tion process does not simply kill these two pollutants. There is a molecular change and the CO is **converted** to CO₂ (carbon dioxide) and O₂; NMHC is converted to CO₂ and H₂O, which are all harmless to humans.

The increasing level of carbon dioxide emissions is a major contributor to global warming. But again, that's another subject. Suffice to say that the volume percentage being converted from the pollutants is very small in relation to the volume of CO₂ being created by combustion.

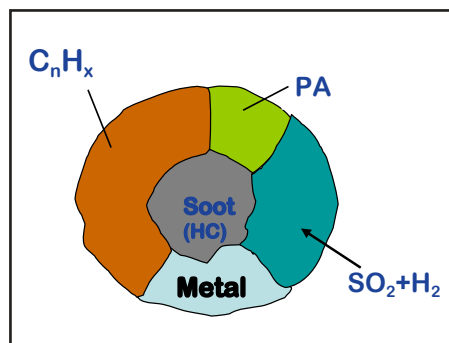
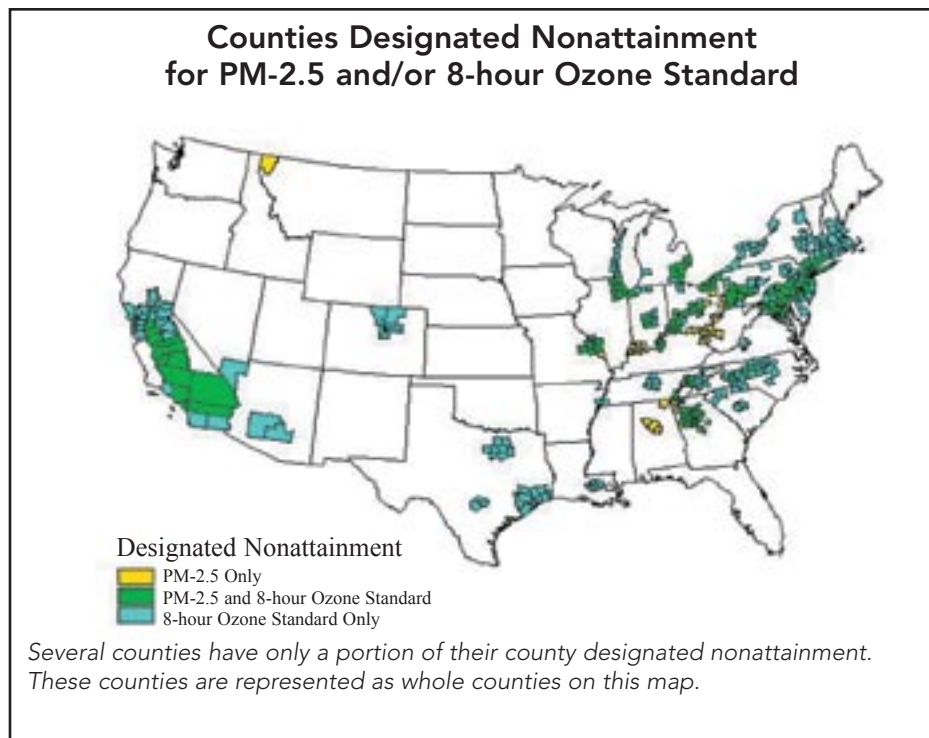
Solutions for Diesel Engines

Diesels are lean burn engines so the 3-way catalyst is not an option. However, special versions of the oxidation catalyst, conveniently known as the **Diesel Oxidation Catalyst (DOC)** provide an easy solution for the reduction of CO and HC from the exhaust. The main difference is that the DOC contains ingredients in the washcoat formulation to handle **sulfur** in the fuel. DOCs have the ability to reduce CO and HC by >98%.

There are a few areas of the country requiring CO levels lower than the EPA-mandated levels. But many local area regulations are focusing on particulate matter because of the high health risks associated with airborne PM, especially in the “non-attainment areas” of the country that do not meet the Federal limits on airborne PM. Local and Federal funds are being made available to retrofit school and transit buses with particulate filters. In April, 2008 the government announced that \$50 million of funding would be available as part of the Clean Diesel Program.

Particulate matter is the pollutant that is about to have the greatest regulatory change in allowable emissions from diesel exhaust. And now that the stationary engine exemption from EPA Certification is no longer applicable, all new diesel engines in the power generation industry will have to conform when these tight regulations kick in.

Particulates consist of a core of carbon, surrounded by other products of combustion that are *stuck* to them—unburned particles of fuel and oil and traces of metals for example. Individual particles are virtually invisible, but collectively they appear as the smoke you see from older diesels on start up and when the genset takes the electrical load. The human hair is about 80 microns



in diameter; in comparison, a particulate is only 10 microns.

PM is getting regulatory agency attention because it is a serious health hazard. It is this pollutant that is being targeted by the EPA, CARB and other regulatory agencies around the world. The fact is that PM is an airborne pollutant that we inhale in its presence. Because the particles are so small, they go deep into the lungs, some attaching to the walls of the lungs. According to medical experts and numerous studies, particulate matter:

- Can cause lung damage or premature death;
 - Can aggravate respiratory conditions such as asthma and bronchitis;
 - Is likely to cause cancer in humans.
- Also, PM contributes to the creation of haze, restricting visibility, contributing to:
- Ozone formation;
 - Acid rain;
 - Global climate change.

The Environmental Protection Agency (EPA), has aggressively attacked the emissions of PM in its regulations, particularly in Tier 4, which become effective for most horsepower nodes in 2014. PM has to be reduced from the Tier 3 level of 0.15 g/bhp/hr to 0.015 g/bhp/hr—a **reduction of 90%**. Presently, it seems unlikely that engine manufacturers will be able to meet the new targets with purely combustion improvements and so the use of an exhaust after-treatment device is the most viable solution.

The Diesel Particulate Filter (DPF) works just like the air filter at the other end of the combustion chamber. It just uses a ceramic filter media instead of paper. The exhaust enters the DPF from the engine exhaust manifold or turbocharger. The face of the DPF consists of many cells, usually about 200 per in². Every open cell at the entrance is blocked at the other end. Every alternate cell is blocked at the entrance but open at the other end.

The exhaust therefore, only has one option: it enters an open chamber but has to pass through the porous wall of the filter into an adjoining chamber which is conveniently open at the other end. The PM/soot is trapped at the wall and only clean, filtered exhaust gas is able to exit. The materials used by most manufacturers are cordierite, a ceramic type of material and silicon carbide.

What happens to the PM that is trapped? At high engine temperatures there is a chemical reaction known as oxidation, in which nitrogen dioxide (NO_2) breaks down the PM and converts it to nitrogen and CO_2 , which is able to flow through the filter walls and harmlessly into the air. The chemical reaction creates heat energy, referred to as an exothermic reaction, and this further aids the oxidation process as it raises the temperature.

This is fine while the engine exhaust temperature is high enough for this reaction to occur. If it is too low, the PM will not get oxidized and will build up in the filter. Gradually the backpressure in the exhaust system will increase as the DPF captures more PM and retains it in the cells of the filter.

There is a point at which the volume of PM entering the DPF is equal to the PM being oxidized. This is known as the Balance Point Temperature (BPT) and under this condition there is no gain or reduction in the particulate matter stored on the filter. If the temperature is below BPT, there will be a gain in the volume of PM stored in the fil-

ter, but as it rises above BPT, the PM will be reduced. The BPT is lower with a catalyzed DPF than an un-catalyzed DPF.

DPFs are usually catalyzed with a coating of Platinum (Pt), a precious and expensive metal. This has the benefit of oxidizing the carbon monoxide (CO) and hydrocarbons (HC) from the exhaust. It also reduces the BPT, which means that the DPF oxidizes the PM at a lower exhaust temperature. This oxidation process is referred to as **regeneration**.

To size the DPF for a specific application requires the engine exhaust flow and temperature data under the normal and maximum operating conditions. An engine may require a single or multiple DPFs (all in parallel, not series) to maintain operation at an acceptable backpressure for the engine and to provide a level of PM storage capacity. DPFs are usually combined with an exhaust silencer in order to make the best use of the space available. But care must be taken on a retrofit application to ensure that the genset structure is capable of supporting the added weight of the DPFs. If not, an independent means of sup-

port for the DPF housing may be needed.

Diesel engines used as prime movers for power generation fall into two main categories from a DPF perspective: prime power and standby power. Prime power applications, including cogeneration, CHP, rental, distributed generation, etc. will typically be constantly regenerating a DPF since the exhaust temperature is well above the BPT.

The standby generator set on the other hand, is generally started automatically once each week to go through its exercise cycle of start, run for one hour and shut down—no load, very low exhaust temperature. Under these conditions, the DPF will not self regenerate and before the backpressure reaches a critical point for the engine, a planned regeneration is required. These are the options:

1. Increase the time between auto start exercises beyond the traditional one week and decrease the running time in order to extend the time required before regeneration.
2. Apply the facility load to the genset, thus creating higher exhaust temperature. This will also test the entire gen-

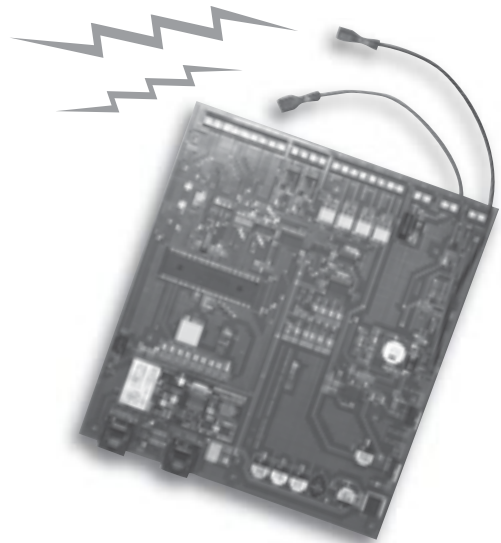
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3. Arrange for the set to be run with a load bank, which will also benefit the engine. Load bank service is available from most generator set distributors. Many specifying engineers are now recognizing the benefits of routine genset tests under (partial) load conditions. This has resulted in an increase in the number of new standby generator sets being supplied with a radiator mounted load bank.
4. Remove the filter from its housing and send it to be externally regenerated by an approved service provider. There are special procedures for external regeneration in order to prevent thermal stressing of the filter.

Small amounts of lubricating oil in the exhaust stream will burn, leaving ash deposits on the walls of the filter. Eventually, the accumulation of ash will affect the

performance of the DPF and it will need to be removed. Since ash is inorganic and non-harmful, it may be removed simply by blowing it back out with compressed air at the exit end and vacuuming it from the inlet end using normal safety procedures.

When a DPF or any catalyst is to be installed in a new exhaust system for the first time, the engine should be run under load for a few hours *without the catalyst element* to ensure that the exhaust system is clean and clear and to prevent any loose pieces from impinging on the front face of the device. But check to be sure this procedure does not violate local regulations!

Careful consideration has to be given, at the sizing stage, to the soot carrying capacity of the filters and the backpressure in the total exhaust system. Operating a diesel engine at higher than the manufacturer's maximum allowable pressure can result in increasing crankcase pressure and fuel consumption and slow reaction to block load acceptance. For this reason it is recommended that diesel particulate filters be provided with a pressure differential switch. This will constantly monitor the

pressure in and out of the DPF and provide an alarm and/or pre-alarm for the system. This may be connected to the genset's control panel and annunciator panel to give audible and visual warning that the DPF requires attention.

The California Air Resources Board (CARB) has established classifications for exhaust after-treatment devices that reduce particulates.

- Less than 25% reduction in PM—no classification (CARB is just not interested)
- Greater than 25% - CARB Level 1
- Greater than 50% - CARB Level 2
- Greater than 85% - **CARB Level 3**

CARB Level 1: Diesel oxidation catalysts are generally in this category; they will generally reduce the total PM by 25–30%.

CARB Level 2: Several devices have made it to Level 2 including “flow through” particulate traps and some actively regenerated filters

CARB Level 3: This is the most efficient and most popular device. The wall flow diesel particulate filter can predictably reduce PM by 95–99%. After the CARB Level

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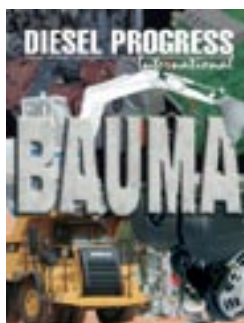
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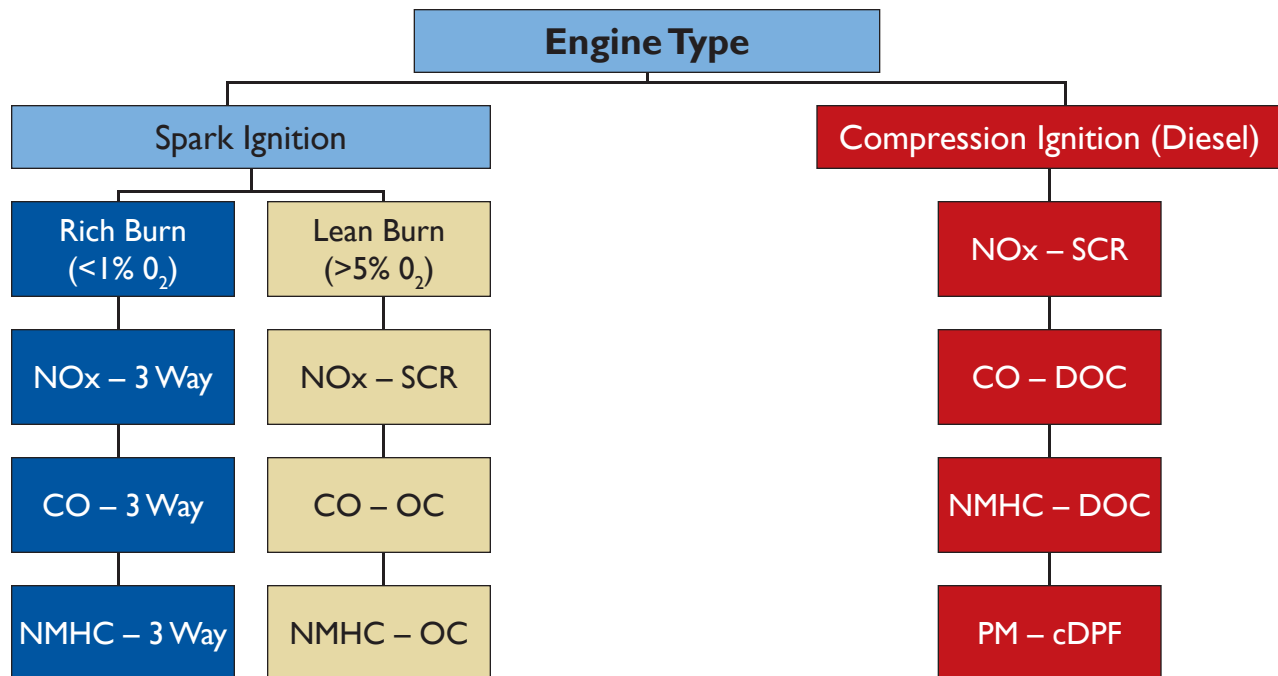


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Options for Emissions Reductions from Internal Combustion Engines



Non methane hydrocarbons (NMHC); Selective Catalyst Reduction (SCR); Oxidation Catalyst (OC); Diesel Oxidation Catalyst (DOC); Catalyzed Diesel Particulate Filter (cDPF)

3 had been in effect for a short while, it was realized that some qualified DPFs were actually increasing the NO₂ (the most harmful ingredient of NO_x) level in the exhaust. CARB then added the requirement that to qualify for Level 3, the device should not increase NO₂ by more than 30%, reducing to 20% in 2009. Devices that meet these new criteria are classified as CARB Level 3 PLUS.

To ensure that these devices actually meet their standards, CARB requires that the candidate DPFs be tested by an independent, CARB certified test laboratory under a preset test cycle. This testing requires numerous cold starts without regeneration and operation for at least 1,000 hours running time.

CARB does not *certify* these devices, but on completion of the review of the test data, they do issue an Executive Order stating that the performance of that particular filtration device has been “**verified**” by them. The manufacturer is authorized and in fact required to attach a CARB Verified label to the DPF housing. This enables a user to install and operate a stationary generator set with a DPF without having

to get an emissions test on site; the CARB label confirms to an inspector/tester that the device meets the performance criteria established by the California ARB.

Diesel particulate filters are a mature technology. Most U.S. trucks manufactured since the start of 2007 have DPFs installed. Over 50% of European car sales are diesels and have DPFs as standard equipment. Many of these diesel-powered cars will be introduced to the North American markets in 2008/9 as they are able to meet the U.S. emission requirements. The 2007 24-hour sportscar race at Le Mans was won by a diesel car with a DPF for the second consecutive year. And an increasing number of engines in the power generation industry are going to have a DPF in the exhaust system, even before being required by the Federal government. No more exhaust smoke on start up, and virtually none of the traditional smell of diesel.

Compression ignition and spark ignition engines cannot quite achieve the zero emission status, but they are very close. It has been documented that in many parts of the country, the **air being exhausted from a latest generation diesel engine,**

fueled by ultra low sulfur diesel and with a full complement of exhaust after treatment, **was cleaner than the air entering the engine’s air cleaner.** We really have come a long way in the last 15-20 years. ■

About the Author

Michael Pope is the Marketing Manager and Senior Sales Engineer at Süd-Chemie Inc., a Massachusetts manufacturer of emission control catalysts for diesel and natural gas engines, gas turbines and industrial sources. His primary responsibility is the application of oxidation catalysts and diesel particulate filters for prime movers in the power generation industry. Michael’s experience with two diesel engine manufacturers and an engine/generator systems distributor gives him a unique perspective on the total engine emission requirements and solutions. Michael is a past Chairman of the EGSA Education Committee and continues to serve on various sub-committees of the Education Committee. He is an EGSA School Instructor and has also served on EGSA’s Board of Directors. This article is based on his presentation at the recent 2008 EGSA Annual Spring Convention.

The NFPA 70E – A Guide for Meeting OSHA's Electrical Regulations

By Jim White, Training Director, Shermco Industries

At the time of this writing, the NFPA Technical Correlating Committee (TCC) is scheduled to meet in June, 2008 to finalize the 70E, "Standard for Electrical Safety in Employee Workplaces." The TCC oversees the NFPA 70E Technical Committee and must approve any changes that were approved by the Committee during the Report on Comments meeting. Until this happens, no changes can be considered final, as this final vote is required. The process the NFPA uses for the 70E is the same it uses for many of its codes and standards. It is a consensus process, where members of the committee are accepted because of the industry or organization they represent and their expertise. Each prospective member is given a review by the TCC and appointed to a specific committee.

Proposals are solicited by the NFPA from the general public. Anyone can submit a proposal, which is straightforward and simple, by using the form available in the back of the 70E or by going to NFPA's website at www.nfpa.org. All proposals received by the closing date are cataloged and assigned a number. The committee members meet at the Report on Proposals (ROP) meeting and all proposals are discussed and debated. Some are accepted as written, some are accepted with changes and some are rejected. A number are rejected because the submitter did not follow the guidelines for submitting a proposal, and the committee is not allowed to "read between the lines." Each has to be reviewed on its own merits. This last cycle of the 70E there were 579 proposals (give or take), which makes the review last far into the evenings.

The proposal comments are then collated by NFPA staff and a Report on Comments (ROC) document is developed and sent to all persons who submitted proposals. This allows them to review what action was taken on their particular proposal and if they do not agree, they can prepare comments and submit them to the committee. A ROC meeting is held where all comments from the proposers are considered and another vote is taken. Several times people have clarified their original proposal or

have come into the meeting and presented new information that caused the committee to reconsider their earlier vote. All of these final changes are assembled into a draft document so the committee members can review how all the actions affect the standard and see if there are any unintended consequences to their votes. A final vote is made by ballot after everyone has had adequate time to review the draft document. Sometimes the votes here can be different than the votes in the ROC meeting, as people have time to reconsider their previous position on the proposals and comments. Usually, though, the votes are very similar as to the ones taken in the committee meeting.

The first edition of the NFPA 70E was issued in 1976 at the request of OSHA, so it could be used to develop Subpart S sections concerning electrical safety. The first edition contained primarily the safety-related articles of the National Electrical Code, which is 29CFR1910.303 to .308. Safety-related work practices appeared in later editions. The 70E did not get much attention until the 2000 edition came out, which contained the tables for using and selecting arc-flash PPE. The tables, which were included as 130.7(C)(O)(a), 130.7(C)(10) and 130.7(C)(11) provided, for the first time, a real method for electrical workers to choose what OSHA termed "appropriate electrical protective equipment" [29CFR1910.335(a)(1)]. This eliminated much of the confusion in the industry about how to comply with the OSHA Federal regulations, but had no guidance. Let me interject at this point that some people love the tables, some hate them, but since 1999 there has not been one incident reported to the 70E Committee where a worker was seriously injured using the tables. Personally, I think that's a pretty good track record. The 2002 edition of the *National Electrical Code*, NFPA 70 Article 110.16, required labeling of equipment to warn qualified workers about the hazard of arc flash and shock. This forced

the contracting industry, and their customers, to not only attach labels, but also start looking at implementing programs for arc flash protection. It's pretty difficult to ignore hazards when you're pasting labels with warnings about them on equipment being installed. This caused a large number of workers to ask what it was all about.

The timeline for 70E revisions has been a little jagged lately. The 2004 edition was really supposed to be a 2003 edition, but was delayed due to issues primarily with the tables. Some of the committee members wanted to use just the hazard for the HRC levels, while others wanted to use risk as well. It was decided at that time to use the tables from the 2000 edition of the 70E, and a lot of changes did not make it into the tables. The 2009 edition was to be a 2008 edition, but the NFPA kicked it back a year so its cycle did not coincide with the NEC cycle, as many of the 70E committee members were also on the NEC panels. So the 70E is revised every three years, give or take.

Committee action is finished for the 2009 edition of the 70E, which is to say that the Report on Proposals (ROP) and the Report on Comments (ROC) balloting is completed. The Technical Correlating Committee (TCC) now has the 70E revisions that are based on those two ballots and they will ballot on what they accept or do not accept. This is one area many people don't understand. Until the TCC accepts the 70E revisions, they are not final. This will take place at the meeting scheduled for June, 2008. The final version of the 70E should be completed and published in October 2008 as a 2009 standard. This becomes even more important, as there have been rumblings that the TCC will not accept some of the changes voted on by the 70E Committee. So when anyone discusses changes in the 70E, it can only be done with the understanding that no one has final information.

Some areas can be discussed generally,



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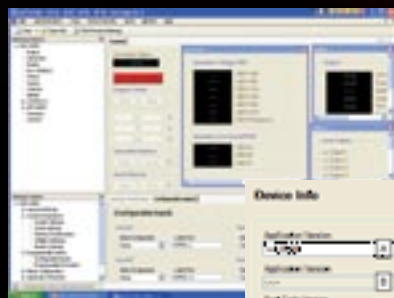
Easy Interface

Following the highly successful debut of the DGC-2020, Basler Electric introduces its new Load Share Module. This remote auxiliary device interfaces to the DGC-2020 and provides analog outputs to the power system in the form of analog bias signals to the voltage regulator and speed governor. When the breaker is closed and Load Sharing is enabled, the LSM-2020 shares real power load proportionally with the other generators on the Analog Load Share Line.



LSM-2020 Load Share Module

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DGC-2020
Monitor/Setup Screen



LSM-2020
Device Info Screen

LSM-2020 Features

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- Load Ramping on and off
- Demand Start/Stop control
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such as the work of the task groups. I was a member of two task groups; the Word and Phrase Task Group and the Tables Task Group. Both of these task groups really went to what I consider to be the heart of the 70E. We committee members strive to make the 70E as clear as possible, to eliminate ambiguities and prevent misinterpretations. This is a monumental task, as many people read the 70E not as electrical workers, but as New York Lawyers—each word dissected and twirled around until its intent can become lost. The Word and Phrase Task Group determined that the use of the word “live” was jargon and should not be used. In its place the word “energized” is used. The word “live” is defined by the word “energized,” so it did not make sense to use both. Similar rationale was used for other areas. The intent is to be as clear as possible.

Two examples are given below on how this changes “live” to “energized:”

- ...live energized electrical conductors or circuit parts...
- The title of Article 130
— Working On or Near Live Parts
— Work Involving Electrical
— Hazards

Other phrases can be even stickier, especially because many people have finally come to terms with them, and now we are suggesting changes. Instead of saying “working on or near,” which has always been problematic, the limits of approach will be used. There are three examples:

- “...working on or near within the Limited Approach Boundary...”

- “...working on or near within the Flash Protection Boundary...”
- “110.8(A) General - Safety-related work practices shall be used to safeguard employees from injury while they are working on or near exposed to electrical hazards from electrical conductors or circuit parts that.....”

This recommended wording is much clearer and leaves little doubt as to what the intent is. The specific hazard of concern is identified or, as in the third example, all hazards are indicated. These wording changes should resolve issues with ambiguity and make the intent clear to the worker. The goal of the entire 70E Committee, TCC and the NFPA is to make the 70E a usable safety standard, one that is as clear and concise as humanly possible. It may take one or two more passes to get everything to the level of the National Electrical Code, but we are well down the road.

The tables are another area of high interest to most electrical workers. Many workers find them difficult to use, while others do not have the same difficulty. Many of the problems people have in using the tables could be resolved by reading the notes in the tables. I’ve seen a number of people try to apply the tables and go into the weeds. In many cases they are not enhancing their safety, but could actually be putting themselves in a dangerous situation. The Tables Task Group worked to make the tables clearer by using the same terminology that is found in the rest of the 70E; no use of “live,” “working on or near”

or other vague or misleading language, although “live” was left in the table in a few places to focus on the shock hazard.

In Table 130.7(C)(9) new tasks involving arc-resistant switchgear are being added. If the door is properly secured no FR clothing or equipment is needed to operate or install/remove (rack) breakers. If the door is open, it would have the same level of risk as traditional switchgear. Infrared thermography has been added as a task to some types of equipment. A reduced level of PPE could be allowed if the thermographer does not remove panel covers and does not break the plane of the equipment. Be sure to read all the notes that are included, both in the tables and following them in order to apply these correctly. A new equipment category was added for “utilization equipment fed by a branch circuit of the panelboard or switchgear.” This applies to equipment such as receptacles, motors and other small devices. In the past there was no guidance for this type of electrical equipment.

In Table 130.7(C)(10) the Hazard/Risk Category minus 1 (HRC -1) was also recommended to be removed, as we have found few people using it and the designation caused some confusion. In its place a new column (HRC 2*) is being added. Hazard/Risk Category 1 will now require the use of an arc-rated face shield (4 cal/cm2 minimum). The format of the table has been changed so that each Hazard/Risk Category is now in its own box, across in rows, instead of columns.

The 2* HRC designation has seemed



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to be a thorn in most people's side. As someone who is familiar with the tables and their notes, it seemed to be clear to me, but not everyone has that level of understanding. The new tables (if approved by the TCC) should have a separate column for HRC 2* that gives all the PPE and arc flash protective equipment needed for this level. This one item should make life a lot easier for many people. The use of a balaclava hood (the FR sock hood used by NASCAR and other motor sports) is being allowed for use in the 2* HRC. This provides an additional level of protection to the face and neck area, and it protects the back of the head; something not done by just an arc-rated face shield. A full arc flash hood can still be used, and may be preferable to the use of the balaclava hood under some circumstances. Speaking of wording changes, we on the committee are changing FR to arc-rated, as there are other, unsuitable garments that have an FR rating or designation. Arc-rated means it has all the necessary characteristics and approvals to be used by electrical workers.

Another change will be the elimination of HRC -1. I don't know if anyone actually used this Hazard/Risk Category, but the Task group felt that adding a separate HRC for Hazard/Risk Category 2* would be more useful than keeping HRC -1. The use of a balaclava hood (FR sock hood) was accepted for use in Hazard/Risk Category 2*, if it has a minimum arc rating of 8cal/cm². The format of the table has been changed so that each Hazard/Risk Category is now in its own box, across in rows, instead of columns.

In Table 130.7(C)(11) the typical clothing systems were revised to concentrate on the arc rating, rather than the number of layers,

so newer technologies can be applied to arc flash protective clothing systems.

One of the biggest possible changes, provided it passes TCC muster, is the elimination of Chapter 4, which is basically an abridging of the NEC. In the past the 70E and NEC were in the same cycle, so the material that made up Chapter 4 was from the previous NEC, rather than the newest. That has been corrected for this cycle, but most committee members felt that Chapter 4 caused more issues than the good anyone received from it. This is a tough one, as the same TCC that oversees the NEC also oversees the 70E and feelings run high on this topic.

A lot of time and effort went into upgrading the Hazard/Risk Assessment process in Annex F, which should provide much more guidance in assessing the hazards. It has been greatly expanded and offers a simpler matrix approach for determining risk.

Summary

NFPA 70E should be finalized in June, 2008 by the Technical Correlating Committee. The next (2009) edition is due to be published in October, 2008. The 70E is the second-most published document from the NFPA, with the National Electrical Code (NFPA 70) being the highest-selling code/standard. This, and the huge number of proposals this cycle, indicates how important the 70E has become to electrical workers. Its acceptance by OSHA as a guide for meeting the regulations enhances the standing of 70E in the work place and should be used by all persons performing electrical maintenance, troubleshooting or testing. ■



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Medical Center Overcomes Its Challenges and Brings it All Together

The Vanderbilt University Medical Center (VUMC) needed to consolidate several standby power generators that served various parts of this major teaching and research medical center in Nashville, TN. The new generator facility needed to be built close to the existing electrical infrastructure yet could not be located within existing structures because of space limitations. Noise, exhaust fumes and fuel storage were also constraints that demanded consideration. To meet these needs, The Vanderbilt Clinic (TVC) Highbay Power Plant project was launched in 2006 to provide the capability for instantaneous switchover during a power interruption and ample power generation capacity to meet this critical-care medical center's need for reliable backup power. With acute medical care provided around the clock at VUMC, an uninterruptible power supply is literally a matter of life and death for its patients.

VUMC is a major teaching and critical-care medical center that has built a strong reputation as a leader in medical education, research and patient care throughout the Southeast and the nation over the course of its 127-year history. In 2007, TVC had over 1,000,000 patient visits, and more than 50,000 patients were admitted to Vanderbilt University Hospital, with a substantial number of patients from outside Tennessee. A principal referral center for physicians and patients throughout the region, Vanderbilt University Hospital and TVC consistently rank among the premier health care facilities in the United States. VUMC is ranked among the foremost programs in the nation by *U.S. News & World Report* in its annual edition of "America's Best Hospitals."

VUMC set specific goals for the consolidation of its standby power generation capability. The Joint Commission on the



Sound attenuation was a major concern on the VUMC project.

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Case Study: Vanderbilt University Medical Center

Accreditation of Healthcare Organizations (JCAHO), which accredits VUMC, requires that the power system operate 24/7 with full redundancy, reliably ensuring the switchover of power within 10 seconds of any interruption. JCAHO mandates a combination of utility and generator backup power to achieve full compliance and that any standby power generation system be tested at 30% load for 30 minutes at least monthly. The TVC Highbay Power Plant provides automated test data from these monthly tests that can be accessed remotely.

The Solution

To meet VUMC's need for a reliable, redundant standby power source, four Cat® 3512B generator sets and customized switchgear were configured and installed. Each generator set produces 4,160 volts for transmission to 480-volt substations. Double-ended parallel switchgear with parallel ties across the breaker allows additional priority loads to come online within the JCAHO-mandated 10 seconds.

The TVC Highbay Power Plant was designed and installed through a cooperative venture with Thompson Machinery Corporation, the local Cat dealer, that included design work from Eaton Electrical, Inc. and Smith, Seckman & Reid, Inc. Thompson Machinery received installation and general contractor work from Turner Logistics through Turner Universal and electrical contracting from Wolfe and Travis Electric. Caterpillar designed the new components to use 15-kV breakers to match the existing wiring at

VUMC, to help integrate the new system with the existing infrastructure, and to increase the versatility of distributing power.

The cornerstone of the TVC Highbay Power Plant is the 5-kV metal-clad switchgear with Powerlynx 3000 control, enhanced operator interface using touch-screen controls and remote PCs for monitoring and control. According to John Deason of Thompson Machinery, historical trends of power output and distribution can be monitored, and routine maintenance of all components of the system can be tracked.

"(The customized) switchgear helps the hospital run more efficiently. Once you have a reliable system with established trending, you can monitor the system for its routine maintenance needs and, of course, perform the monthly testing," said Deason.

Designed to be fully compatible with the existing Automatic Transfer Switch (ATS) interface, the switchgear facilitates the automated testing and reporting mandated by JCAHO. During each monthly test, a simulated shutdown of the utility power supply is conducted, and the TVC Highbay Power Plant must demonstrate the ability to switch over to full output within 10 seconds.

"With this system in place, the hospital has a great deal of redundancy and reliability built in," said Deason. "Our monitoring system gives the operators far more information than they had in their older backup generator installation." And all of the information can be obtained in real-time, from a remote PC, according to Deason.

"You no longer have guys with clipboards taking transfer switch



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output readings for 30 minutes each month,” said Deason.

The Results

Installation of the initial four generators at the TVC Highbay Power Plant was completed in December 2006. Chris Buckner, the lead electrical engineer with VUMC's Office of Space and Facilities Planning, oversaw the TVC Highbay Power Plant project from initial scoping through final commissioning. For Buckner, the decision to go with Caterpillar generators was based on VUMC's experience with Cat power products.

Buckner reports that the successful installation and rollout of the first four generators in 2007 has cleared the way for the installation of a fifth unit in 2008 and a sixth unit in 2009. Buckner notes the campus has 24 emergency generator sets currently in place, and a capital project is currently underway to replace two aging generator sets with new power systems.

Since the installation was completed, the JCAHO-mandated monthly tests have been conducted successfully. “Testing involved four different shutdowns to individually test each and every start signal and each load shed from the 31 transfer switches associated with the power plant,” Buckner said. While JCAHO mandates the minimum requirements for power redundancy, VUMC and Caterpillar tested the system far beyond the minimal requirements—for obvious reasons.

“We did extensive testing of each generator and each transfer switch because we couldn't have a situation where the hospital

About Vanderbilt University Medical Center

Vanderbilt University Medical Center's programs in cancer; ear, nose, and throat; hormonal disorders; gynecology; kidney disease; orthopedics; pulmonary disease; rheumatology; and urology were assessed as being among the best such programs nationally.

Among VUMC's specialty clinics is the Vanderbilt Ingram Cancer Center (VICC). The VICC, a National Cancer Institute Comprehensive Cancer Center, provides care for cancer patients along with basic and bench-to-bedside research. The state-of-the-art research program provides the latest breakthroughs in treatments for its patients. Additionally, VUMC's Level I Trauma Center, comprehensive burn center, and Life-Flight air emergency transport program offer critical trauma care for a three-state region.

The Vanderbilt Children's Hospital and its 19 specialty services, including the Level IV Neonatal Intensive Care Unit and a dedicated pediatric emergency department, are the only programs of their kind in Middle Tennessee.

The Vanderbilt Heart Institute has become one of the nation's foremost cardiac research programs. The Vanderbilt Transplant Center is the most active in the region, with 500 transplants performed in 2007. ■



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wasn't covered. In fact, we conducted a continuous 36-hour run test of all four generators synchronized to the board after each of the generators was extensively tested individually so that we could simulate an extended power curtailment from our local utility—which we do experience from time to time,” Buckner explained.

“We installed sound attenuators on the generators, and the units are so quiet that cell phone conversations are not interrupted on a sidewalk that’s just 10 feet from the radiator discharge louvers,” Buckner said. “One of the main entrances to our clinic is directly across from this plant, and we were expecting to have a possible echo problem or just noise in general that would disturb patients entering the clinic. But when we start our generators up, no one even looks over to see what’s happening. It truly is impressive.”

According to Deason, with the extensive testing and final adjustments of the power plant now complete, reviews of the new system have been uniformly positive.

“VUMC especially values the automated testing capability because of the amount of information they can get about the whole system, the fact that they can be alerted of a problem before it escalates, and that they can monitor and schedule maintenance to prevent problems,” said Deason.

He points to enhanced confidence in the system’s reliability as one of the most significant achievements of the TVC Highbay Power Plant. “Because the system is so much simpler to operate, test, and maintain, there’s much greater confidence in its ability to be there when it’s needed,” said Deason. ■



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GE Becomes Majority Shareholder in Solar Technology Company

GE Energy has announced it has increased its equity share in PrimeStar Solar, Inc., an emerging solar thin-film technology and manufacturing company. GE already held a minority equity share of PrimeStar Solar, as announced in September 2007.

PrimeStar Solar, headquartered in Golden, Colo., was formed in June 2006 to develop and commercialize thin-film photovoltaic modules. The company has 60 employees, including a core management team with more than 100 years of thin-film equipment and process experience.

"Increasing our stake in PrimeStar Solar to a majority interest underscores our continuing commitment to solar energy. GE Energy believes that renewable resources, including wind and solar, will play an ever increasing role in the future of the global energy industry," said Victor Abate, vice president of renewables, GE Energy.

Solar energy is playing an increasing role in GE Energy's renewable energy portfolio and is expected to grow even more as

energy costs continue to rise. In addition to solar, GE's renewable energy portfolio consists of wind and biomass. As the leading U.S. supplier of wind turbines, GE Energy's installed fleet of more than 8,500 1.5-megawatt wind turbines recently surpassed 115 million operating hours in commercial service worldwide.

GE's corporate-wide "ecomagination" initiative is intended to address the need for cleaner, more efficient sources of energy, reduced emissions and abundant sources of clean water. Under the program, GE plans to invest \$1.5 billion annually in research in cleaner technologies by 2010.

The company also reports that it is providing distributed control systems for 50 new biomass-fueled power plants that are being built in China as the country works to rapidly develop new renewable energy sources to meet its pressing energy and environmental goals.

The biomass plants will provide much-needed electricity to support local grid networks at a time when China's demand for power is projected to grow by about 13.5%

in 2008, with the country's total annual demand currently exceeding 3.7 trillion kilowatt hours (kWh). The 50 plants will each feature two, 12MW power blocks that will generate a total of 7.2 billion kWh per year, which is enough to support an average of 70,000 families in China.

The biomass plants are being built by Wuhan Kaidi Electric Power Engineering Co., Ltd. in the Hubei, Hunan, Anhui, Shanxi, Fujian, Jiangsu and Jiangxi regions. Rice husk, straw and animal manure will be used as the biomass stock.

The first 2x12MW biomass power block is scheduled to enter commercial service at the end of August 2008. All 50 plants will be operational by December 2010. Biomass projects promote rural employment by creating highly skilled, valuable job opportunities in the utility, power and agricultural equipment industries.

Seeking to address China's converging energy and environmental concerns, a comprehensive energy program was issued by the China National Development and

Continued on next page



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Reform Commission in June 2007, establishing an ambitious plan to reduce total emissions of major pollutants by 10% by 2010. To help achieve this goal, China is offering developers a subsidy to encourage the rapid construction of biomass power plants like the new Wuhan Kaidi projects.

In 2006, GE launched its ecomagination program in China, reaffirming the company's commitment to help the country develop cleaner, more efficient sources of energy and abundant sources of clean water while reducing emissions. GE Energy is a leading supplier of power generation and energy delivery technologies. For more information, visit www.ge.com.

Honda Rolls Out New Hydrogen Car in Japan and California

CNNMoney.com reports that Honda's new zero-emission, hydrogen fuel cell car—the FCX Clarity—has rolled off a Japanese production line and is now headed to California. According to Honda, the hydrogen-fueled FCX Clarity is two times

more energy efficient than a gas-electric hybrid and three times that of a standard gasoline-powered car.

CNNMoney says that Honda expects to lease out a “few dozen” units this year and about 200 units within a year. In California, a three-year lease will run \$600 a month, which includes maintenance and collision coverage.

The biggest obstacles to wider adoption of fuel cell vehicles are their cost and the severe lack of hydrogen fuel stations. According to Honda's web site, the initial release of the vehicle is limited because “in order to drive a fuel cell vehicle, you have to be able to refuel it . . . Hydrogen fuel stations are critical to the deployment of a fuel cell car and, as it stands now, stations accessible to the public are still quite limited.”

As a result, said Honda, “only customers currently residing in the Torrance, Santa Monica and Irvine (California) areas who meet additional qualification criteria will be eligible to take an FCX Clarity home.”

For information, visit www.Honda.com.

PennWell Launches POWER-GEN International Community

PennWell Corporation, producers of the POWER-GEN International Show, have launched an online “community” as a preview to the upcoming 2008 POWER-GEN International Show to be held December 2-4 in Orlando, FL. The online resource provides industry product and service information and allows show attendees to plan their show visit and schedule on-site meetings. Industry professionals may also use the site as a year-round reference for the latest industry-wide information.

For more information, visit the site at www.community.power-gen.com.

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EGSA's mission is to bring together representatives of the various segments of the On-Site Power Industry, to learn, share ideas and experiences, advance the science of On-Site Power generation, improve performance and profitability of members, and the quality of service to power users.

1. Contact Information

Please type or print all information in upper and lower case (NOT ALL CAPS!)

Company _____

Address _____

City _____ State/Province _____

Zip/Postal Code _____ Country _____

Phone _____ FAX _____

Official Representative _____ Title _____

Representative's E-Mail _____ Company's Web Address _____

How did you hear about EGSA? ☐ Web site ☐ Powerline magazine ☐ Colleague ☐ POWER-GEN ☐ Other _____

Why are you joining EGSA? ☐ Certification Program ☐ CEU Program ☐ Power Schools ☐ Buyers Guide Listing ☐ Other _____

2. Member Classification

Read the Membership classifications below and check the box that describes your firm's classification.

I. FULL MEMBERSHIP

☐ MF **Manufacturer Membership**

Any individual, sole proprietor, partnership or corporation seeking membership must apply for a Full Membership as a manufacturer if they meet one or more of the following criteria:

1. They manufacture prime movers for power generation.
2. They manufacture generators or other power conversion devices producing electricity.
3. They manufacture switchgear or electrical control devices.
4. They manufacture or assemble generator sets, UPS systems, solar power, hydropower, geothermal, or any other power production or conversion system including related components or accessories for national or regional distribution.
5. They are a wholly owned subsidiary of a firm which qualifies under rule one through four.

☐ DD **Distributor/Dealer Membership**

Any individual, sole proprietor, partnership or corporation actively engaged as a distributor or dealer for products listed under Manufacturer Membership may apply for Full Membership as a Distributor/Dealer. If an organization qualifies under Manufacturer Membership, it is not qualified under this section.

☐ CI **Contractor/Integrator Membership**

Any individual, sole proprietor, partnership or corporation actively engaged as a Contractor or Equipment Integrator of products listed under Manufacturer Membership, not brand by brand, geographic territory or contractually obligated as a Distributor/Dealer of a specific product. These firms typically purchase products from a Distributor/Dealer, Manufacturer or Retailer, adding value through installation, product knowledge, relationships, unique services, etc., and then re-sell the resulting product to an end-user.

☐ MR **Manufacturer's Representative Membership**

Any individual, sole proprietor, partnership or corporation actively engaged in the representation of products listed under Manufacturer Membership may apply for Full Membership as a Manufacturer's Representative. If an organization qualifies under Manufacturer Membership, it is not qualified under this section.

☐ EM **Energy Management Company Membership**

Any individual, sole proprietor, partnership or corporation engaged in energy management, including Energy Service Companies (ESCOs), Independent Power Producers (IPPs), Integrators, Aggregators, and other similar enterprises may apply for Full Membership as an Energy Management Company.

☐ **Associate Full Membership** (mark appropriate category at right)

Any individual, sole proprietor, academic institution, student, partnership or corporation meeting the requirements of Associate Regular Membership may apply for Full Membership at their option to enjoy the privileges of Full Membership, including the rights to vote and to serve on EGSA's Board of Directors. Initiation fees and annual dues will be assessed at the existing non-manufacturers' Full Member rates.

II. ASSOCIATE REGULAR MEMBERSHIP

☐ AA **Trade Publication Membership**

Any trade publication dealing with the electrical generating systems industry or its suppliers may apply for Associate Membership—Trade Publications.

☐ AB **Trade Association Membership**

Any trade association made up of individual or company members sharing a common interest in the electrical generating systems industry may apply for Associate Membership—Allied Associations.

☐ AC **Engineer Membership**

Any consulting or specifying engineer may apply for Associate Membership—Engineer. Membership may either be held in the employer's name or individual's name under this classification. Individuals whose employer qualify as a Full Member, as described in the Full Membership section, do not qualify for this category.

☐ AD **End-User Membership**

Any individual employee of a company who owns or operates electrical generating equipment and/or related switchgear or components, whose responsibility to his employer includes planning, design, installation, supervision, or service of such equipment may apply for Associate Membership—User. Membership may either be held in the employer's name or individual's name under this classification. Individuals whose employer qualify as a Full Member, as described in the Full Membership section, do not qualify for this category.

☐ AE **Service Membership**

Any individual, organization or academic institution that offers services such as research, testing or repair to the electrical generating systems industry may apply for Associate Membership—Services. Membership may either be held in the individual's name or the organization's name under this classification. Individual companies whose employer or parent organization qualifies as a Full Member, as described in the Full Membership section, do not qualify for this category.

☐ AG **Educational Institution Membership**

Any postsecondary vocational-technical school or college offering on-site power generation-related instruction may apply for Associate Membership—Education Institution.

☐ AR **Retiree Membership**

Any individual who retires from a member company may apply for Associate Membership—Retired. This classification does not apply to any individual who is employed more than 20 hours per week.

☐ AF **Student Membership**

Any individual currently enrolled at an academic institution may apply for Associate Membership—Student.

Application for Membership – page 2

Dues Schedule (Use for Section 3)

	Annual Dues	Initiation Fee	TOTAL
Manufacturer.....	\$825	\$200	\$1025
Energy Management Companies.....	\$825	\$200	\$1025
Distributor/Dealer.....	\$285	\$100	\$385
Contractor/Integrator.....	\$285	\$100	\$385
Manufacturer's Rep.....	\$285	\$100	\$385
Regular Associate Member.....	\$200	\$100	\$300
Full Associate Member.....	\$285	\$100	\$385
Retiree Member.....	\$90	\$0	\$90
Student Member.....	Complimentary	\$0	\$0

NOTE: A FULL 12-MONTH DUES PAYMENT MUST BE RECEIVED WITH THIS APPLICATION. The Association's Membership Year is January 1 through December 31. Dues payments that extend beyond the first Membership Year will be applied to the second year's dues.

FULL PAYMENT MUST BE RECEIVED WITH APPLICATION.

3. Membership Dues (Please fill in the appropriate TOTAL amount from the above dues schedule.)

Membership Dues \$ _____
Membership Plaque (optional)** \$ 39.95**
On-Site Power Reference Book (optional)** \$ 125.00**
Florida Residents: Add 6.5% Sales Tax to ** items \$ _____
Continental US Residents add \$5 shipping/handling to ** items. \$ _____
Non Continental US Residents should call EGSA
Headquarters for shipping charges for ** items. **TOTAL** \$ _____

4. Payment Method (Payable in US\$ drawn on U.S. bank, U.S. Money Order, or American Express)

☐ Check # _____ Amount \$ _____
☐ Money Order
☐ Mastercard ☐ Visa ☐ American Express
Card # _____ Exp. Date _____
Signature: _____
Print Name: _____

5. Products/Services Please describe the nature of your business (50 words or less, NOT ALL CAPS). If you are a Manufacturer's Representative or Distributor, please indicate for manufacturers you represent and/or distribute for; if a student, please provide name and location of your school, your major and your anticipated graduation date:

Do you buy AND sell equipment? ☐ Yes ☐ No

Do you manufacture packaged equipment? ☐ Yes ☐ No

Available Codes:

01 ---Batteries/Battery Chargers	09 ---Generator Laminations	19 ---Silencers/Exhaust Systems/Noise Abatement
02 ---Control/Annunciator Systems	10 ---Generator Sets	20 ---Solenoids
29 ---Education	11 ---Generators/Alternators	21 ---Switchgear and Transfer Switches (Automatic or Manual), Bypass Isolation Switches, and/or Switchgear Panels
30 ---Emission Control Equipment	12 ---Governors	22 ---Trailers, Generator Set
04 ---Enclosures, Generator Set	13 ---Heat Recovery Systems	23 ---Transformers
05 ---Engines, Diesel or Gas	14 ---Instruments and controls, including meters, gauges, relays, contactors, or switches	24 ---Uninterruptible Power Supplies
06 ---Engines, Gas Turbine	15 ---Load Banks	25 ---Vibration Isolators
07 ---Engine Starters/Starting Aids	16 ---Motor Generator Sets	26 ---Voltage Regulators
08 ---Filters, Lube Oil, Fuel or Air	17 ---Radiator/Heat Exchangers	27 ---Wiring Devices or Receptacles
28 ---Fuel Cells	18 ---Relays, Protective or Synchronizing	
03 ---Fuel Tanks and Fuel Storage Systems		

Enter codes here:

Products sold: _____

Products rented: _____

Products serviced: _____

6. Sponsor(s): A "Sponsor" is an EGSA Member who interested you in filling out this application. It is not mandatory that you have a sponsor for the Board to act favorably on this application; however, if a Member recommended that you consider membership, we request that individual's name and company name for our records.

Sponsor Name _____ Company Name _____

7. Official Representative's Authorization

Signature _____ Date _____

**25 Years
of On-Site
Power
Education**

EGSA On-Site **POWER** **GENERATION** **Schools**

Presenting Our New Two-Tiered School!

Basic On-Site Power Schools

Phoenix, AZ
Feb. 12-14, 2008

Milwaukee, WI
June 24-26, 2008

Orlando, FL
Dec. 3-5, 2008*

**To be held concurrently
with POWER-GEN International*

Advanced On-Site Power Schools

New Brunswick, NJ
April 28-May 1, 2008

Austin, TX
Oct. 20-23, 2008

For several years, the EGSA Education Committee and School Instructors have been planning and developing the most significant and major curriculum change in the 25-year history of the school: two school levels. The new curriculum is designed to better meet the needs and diverse backgrounds of those who attend our schools.

Basic School

The Basic School is a general, but still technical, overview of On-Site Power Generation equipment. The Basic School is designed for those who are working in non-technical positions (such as Sales or Marketing, Administrative, or Company Management positions) and for those with less than three years experience working in the industry.

Each registrant will receive handout materials and instruction, a copy of EGSA's *On-Site Power Generation: A Reference Book*, and lunch on each of the three days.

Advanced School

In comparison to the Basic School, the Advanced School will offer more highly technical and in-depth coverage of the equipment. The Advanced School is designed for those who have attended the EGSA Basic On-Site Power Generation School; those who are employed in Engineering, Project Management, or Service positions; and for those with over three years working in the industry.

Each registrant will receive handout materials and instruction, a copy of EGSA's *On-Site Power Generation: A Reference Book*, and lunch on each of the four days.



Electrical Generating Systems Association

The Voice of the Global On-Site Power Industry for over 40 years

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561/750-5575 Fax 561/395-8557 e-mail@egsa.org

Visit us online at www.egsa.org

Stay on Top of Your Game with EGSA's Electrical Generator Systems Technician Certification Program

Think things move pretty fast in today's business world? Think how fast they'll be moving one, five or even 10 years down the road. That's why you need every advantage to stay on top.

It's no secret that technology is becoming more complex—not less—and that makes today's On-Site Power Generation System a lot more expensive. End-users—your customers—don't want just anybody with a basic knowledge of mechanics to install and maintain their equipment. They want to be confident that all work has been performed by qualified personnel. Suppliers want assurance that skilled technicians are performing maintenance and repairs to guard against unnecessary returns or warranty repairs.

As Good as Your Word

In the past, your word was the only assurance that your technicians are skilled and knowledgeable. But now, through EGSA's Electrical Generator Systems Technician Certification Program, there is a way that you can back up those words with objective evidence of your technicians' proficiency.



EGSA offers you a big advantage: For the first time in our industry, we have an objective and accurate way to determine generator technician proficiency. That means that the same standards will be used to measure the skills and knowledge of technicians from Maine to Manitoba and Mexico. Yes, Manitoba and Mexico! EGSA has determined that there is no reason why the test could not be fairly applied to any NAFTA technician.

What are the Benefits?

For the Employer, certification helps ensure that your technicians have the critical knowledge and skills to succeed in their jobs. And everyone will be comfortable knowing that your certified technicians' expertise has been confirmed by the industry organization through a program that was developed by a university. Encour-

aging and helping your technicians become certified signifies your commitment to the highest of standards. Plus, it lends an added level of credibility to your firm and can sharpen your competitive edge. Employing certified techs will promote customer satisfaction and you won't have to be shy about offering assurance that your techs are qualified. Certification can also help you select potential new hires, analyze job performance, evaluate employees and motivate technicians to enhance their skills and knowledge.

Think about the message that certification sends to those with whom you do business. Why would anyone want a technician who isn't certified performing critical maintenance or repair tasks? Employing certified technicians gives you an added tool with which to market your business.

As our members have said, "We've seen too many backyard mechanics damage expensive equipment. This program will provide credibility for my company and will help build pride and a commitment from technicians to be the best."

For the Technician

Certificate holders benefit too. Certification shows employers, clients, and associates that you are committed as a professional. It provides recognition of your knowledge and skill, shows your commitment to your profession and can help with job advancement. Certification is a mark of excellence that you carry with you everywhere you go.

Acquiring certification indicates that you have the knowledge and proficiency required to perform as an Electrical Generating Systems Technician professional. Becoming certified can increase your salary, enhance your skills, and make your job more satisfying.



Certification helps ensure that your technicians have the critical knowledge and skills to succeed in their jobs.

The Certification Test

EGSA collaborated with Ferris State University to develop the certification test and program. Through a scientific process, our panel of technical experts identified 12 duty areas (such as “Basic Electricity”) and 61 tasks (such as “demonstrate knowledge of AC electrical theory”) within the duty areas. The duty areas and tasks were ranked and rated in terms of their relative importance, the frequency with which a task is performed, and skill level (i.e. Senior/Expert; Intermediate; and Entry Level.) All this data was combined to develop the certification test that was then statistically validated through a pilot test taken by generator technicians from across the United States.

Who can take the Test?

There are no pre-qualifications for taking the EGSA Certification test. We recommend three or four years of field experience before taking the test. Technicians who have had formal education in On-Site Power Generation (a degree or certificate from a technical school or community college) may need less field experience. Those who pass the test will have a comprehensive knowledge of basic electricity, the functions of a gen-set’s mechanical and electrical components, the interactions and relationships among components and an understanding of various elements of the installation, service, maintenance, and repair of gen-sets and On-Site Power Generation Systems.

CERTIFICATION TESTING COVERS:

- Automatic Transfer Switches
- Communication & Documentation
- Engine Generator Instrumentation & Controls
- Multiple Generator Switchgear & Controls
- Troubleshooting System Problems
- Auxiliary Support Systems
- Basic Electricity
- Prime Movers
- Governors
- Voltage Regulators
- Generators/Alternators

Use the Study Guide to Prepare!

Use of the program’s Study Guide is an excellent way to help techs prepare for the test and should clearly indicate if they are ready to take (and pass) the certification exam. In addition to useful formula pages, the guide contains almost 200 multiple choice practice questions that cover all parts of the certification test. In addition to identifying the correct answer, the guide also indicates in most cases why a particular choice is correct

and why the others are incorrect. The Guide also identifies resource material where techs can get additional or more in-depth information about a given topic.

Need more information? Visit www.egsa.org to find extensive and detailed information about the certification program. Or contact EGSA Director of Education George Rowley via e-mail at g.rowley@egsa.org.



DISCLAIMER OF LIABILITY

Certified status is an indication that an individual has completed a combination of defined education, experience or examination requirements. However, Certification is not a guarantee or assurance of the competence or ability of any particular individual. Further, given the rapid changes in the field, the Electrical Generating Systems Association cannot warrant that the Examination and other Certification materials will at all times reflect the most current state of the art.

The Electrical Generating Systems Association disclaims liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the Certification Program or the acts or omissions of any person who has been Certified by the Electrical Generating Systems Association. In conducting the Certification Program, including issuing Certifications, the Electrical Generating

Systems Association is not undertaking to render professional or other services for or on behalf of any person or entity, nor is the Electrical Generating Systems Association undertaking to perform any duty owed by any person or entity to someone else. Anyone using the services of a person who has been Certified should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

Electrical Generating Systems Association
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Generator Technicians

Live in the great Pacific Northwest and enjoy the outdoors while advancing your career! Pacific Power Products has openings in Washington, Oregon, Alaska and Hawaii for experienced generator and/or diesel engine technicians for shop and field service work. We are distributors for top tier engine and generator manufacturers. Minimum three years experience required with diesel engines and/or generator sets. We have highly attractive compensation and benefit program with aggressive training programs for the right individuals. Must have a clean driving record. PPC is a drug-free workplace and an EOE employer. Send your resume to bmossey@pac-power.com. No phone calls please.

Territory Sales Manager

KELLY GENERATOR & EQUIPMENT, INC., has an immediate opening for a Territory Sales Manager. We are located and operate in the mid-Atlantic region: Delaware, Maryland, Virginia, West Virginia and Washington, DC. Will develop and foster ongoing business relationships with Electrical, Design and Consulting Engineers, Electrical Contractors, General Contractors, Commercial/Industrial End Users (i.e., Mission Critical Data Centers, Health Care Facilities, Manufacturing), and respond to "bid & spec" opportunities. Must have high initiative, proven ability to execute plans and deliver results. A four year degree is preferred but will consider 3-5 years of relevant experience. Must have previous technical sales experience and demonstrated technical aptitude. We offer full benefits that include medical, dental, vision, 401(k), and profit sharing. Base salary with commission. FAX resumes to 410-257-5227 or e-mail contactus@kge.com.

Generator Field Technician

A fast growing Utah based standby power company has an opening for a full-time field technician to perform routine generator and transfer switch preventative maintenance, troubleshooting, repair work, and startups. Prior field experience in the generator standby power industry is required. Must have a good driving record, be clean cut, and be drug free. Competitive wage, benefits, company cell, and company truck are available for a qualified individual. Please fax resume to 801-544-7010.

EMERGENCY POWER SYSTEM SPECIALISTS

Generator Technician—Experienced

Emergency Systems Service Company in Quakertown, PA, a leading provider of emergency generator sets, has an immediate opening for a technician with a minimum of three years diesel engine/generator set background/experience. Responsibilities will involve troubleshooting, repair and the planned maintenance services of generator sets and peripheral equipment. A neat appearance, clean driving record and good people skills are required. We offer a highly attractive compensation with an outstanding benefits package. A company vehicle and additional training provided. If you are interested in becoming part of our team, please call (215) 536-4973, ext. 25.

Generator Technician—Apprentice

Emergency Systems Service Company in Quakertown, PA, a leading provider of emergency generator sets, has an immediate opening for a person with a strong mechanical/electrical background interested in a career in the power generation service field. Responsibilities will involve minor troubleshooting, repair and the planned maintenance services of generator sets and peripheral equipment. A neat appearance, clean driving record and good people skills are required. An outstanding benefits package, company vehicle and additional training provided. If you are interested in becoming part of our team, please call (215) 536-4973, ext. 25.

Generator Field Technician

KELLY GENERATOR & EQUIPMENT, INC., has an immediate opening for a Generator Technician. We are located and operate in the mid-Atlantic region: Delaware, Maryland, Virginia, West Virginia and Washington, DC. Must have a High School Diploma (Vocational or GED), a minimum of 3-5 years experience servicing industrial generator sets and associated equipment. Must be able to service, repair and troubleshoot the engine, as well as the alternator end of the equipment. Begin work with little or no supervision. MILITARY A PLUS! We offer factory training on the lines we represent as well as "in house" training. Full benefits include a company vehicle, medical, dental, vision 401(k) and profit sharing. FAX resumes to 410-257-5227 or e-mail to contactus@kge.com.

Generator Service Technician

Emergency Power Systems, Inc. in Tulsa, OK has an immediate opening for a technician with advanced knowledge of standby generator systems, including automatic switchgear, diesel and gaseous-fueled engines and all associated components and subsystems. EPS has had a strong regional presence since 1991 in sales, service, rental, custom designs and turn-key installations of standby power systems. Pay commensurate with skills and experience. Send resume via email to rhaynes@epstulsa.com or fax to Ron Haynes at 918-446-2411.

Generator/Sales Position

Baltimore/Washington to call on contractors and engineers to represent local MTU distributor, located in the Middle River, MD area. Generator experience preferred. Excellent salary and benefits for the right person. EOE. Fax resume to 410-687-4743 or email to pfindeisen@johnsontowers.com

National Sales Manager

National Sales Manager for Gillette Generators located in Elkhart, Indiana. Must have technical knowledge of all aspects of engine-driven standby equipment up to 250kW, transfer switch, natural gas and diesel engine fundamentals, electrical theory applications expertise—all are essential. Candidate to hold B.S. degree and possess a minimum of 10 years of industry direct experience. Responsibilities include growing dealer base, expanding relationships with existing customers and managing the in-house sales team. Must be willing to relocate and be able to travel 2 weeks a month. Contact Charlie Habic at crhabic@gillettegenerators.com

Generator Set Sales/Service

Experienced sales/service engineer needed by southern California company to sell engine generator sets. Please respond to J.Kellough@EGSA.org (Reference PLND06JB-1).



Fiberglass Battery Boxes & Trays

Handles 2-8D / 4D Batteries




Davidson Sales Company

www.davidsonsales.com

CALL (386) 274-2079

(800) 383-2078

EGSA Job Bank Guidelines—EGSA will advertise (free of charge) EGSA Member company job openings in the Job Bank. **Free use of the Job Bank is strictly limited to companies advertising for positions available within their own firms. Companies who are not members of EGSA and third-party employment service firms who service our industry may utilize the Job Bank for a \$300 fee.** Blind box ads using the EGSA Job Bank address are available upon request; company logos may be included for an additional fee. EGSA reserves the right to refuse any advertisement it deems inappropriate to the publication. Please send your classified ad (limited to about 50 words) to: EGSA Job Bank, 1650 S. Dixie Hwy, Suite 500, Boca Raton, FL 33432. Or, send it via e-mail to it: J.Kellough@EGSA.org

New EGSA Members

MF=Manufacturer DD=Distributor/Dealer CI=Contractor/Integrator MR=Manufacturers Rep
EM=Energy Management Co. AA=Trade Publication AB=Trade Association AC=Engineer
AD=End-User AE=Service AG=Educational Institution AR=Retiree AF=Student

ABEC Group, LLC(AC)

Lebanon, PA
(717) 274-8808
Contact: Richard A. Carpenter, V.P.
Business: Cogen consulting engineering.

Darren Altazan(AF)

Loranger, LA
Phone: (985) 878-8991
Contact: Darren Altazan, Student
Business: Student taking courses at the National Association of Safety Professionals. I have reached the master safety administrator level. I would like to become a certified generator technician.

AMICI Electric & Generators, LLC . . .(DD)

Norwalk, CT
(203) 853-1681
Contact: Louis G. Gabriele III, Owner
Business: We sell, service and install for Gillette Generators, Generac Generators and Briggs & Stratton Generators. We also install UPS Towers by Gaia Power Technologies.

Robert Barnhart, Jr.,(AF)

North Fort Myers, FL
(239) 297-0254
Contact: Robert E. Barnhart Jr., Student
Business: I am a student at Hodges University working on a bachelor's degree in Information Technology. I am interested in pursuing certification.

Blue Stream Services(DD)

New Iberia, LA
(337) 560-8960 Fax: (337) 365-7753
Contact: Keith Oliva, Division Manager
Business: Blue-Stream Services offers the latest technology in temporary diesel generators suitable for offshore or industrial use ranging in size from 15 kW to 2000 kW. Blue-Stream Services is the only Ingersoll Rand dealer for mobile diesel generators in South Louisiana. Along with diesel generator packages, Blue-Stream Services offers a full line of accessories needed to complete scheduled projects and to successfully solve emergency outages.

Timothy Brislin(AF)

Parma, OH
(201) 546-0596
Contact: Timothy Brislin, Student
Business: Student at Ohio Technical College in Cleveland studying Diesel Technology. Anticipated graduation date is August 2009.

John Cleary(AE)

Summerville, SC
(843) 364-2880
Contact: John A Cleary
Business: I am a graduate of the Army's Generator Repair Technician (52D) Course at Aberdeen Proving Ground. After spending seven years in the Army I separated and went to work for Cummins Atlantic Inc. as a Power Generation Technician. I am currently deployed to Iraq as a defense contractor managing a generator program that powers surveillance equipment.

GENERATOR REPAIR TECHNICIAN WANTED

Wolter Power Systems, a leading Generac Ultimate Distributor, is looking for an experienced, qualified individual to perform on site repairs for its customers. Successful candidate will be able to troubleshoot and repair generators. Preference will be given to an individual who is Phase "B" or Master Certified in generator repair.

A valid driver's license with a good driving record is needed. A company van is provided, as well as competitive wages and complete benefits package. All offers are contingent upon satisfactory drug screen results. We are an affirmative action, equal opportunity employer.

To apply, forward resume to Sharon Cerny c/o Wolter Power Systems, 3125 Intertech Dr., Brookfield, WI 53045, or email: Sharon.cerny@wisconsinlift.com; or fax to: (262) 783-0746.



PROTECT THE TECHNOLOGY THAT PROTECTS THE WORLD.

Pritchard Brown, LLC, the Industry Leader in Technology, Service, Quality and State-of-the-Art Design for Enclosures and System Integration.

- Over 50 years of shelter manufacturing experience.
- Strategically located for domestic and worldwide markets.
- U.L. classified enclosures and U.L. listed base tanks, extensive electrical options and total flexibility.
- Professional sales and engineering staff.
- Integrated EMI/RFI shielding available.
- High performance, maintenance free materials.
- Weather proof environment for service personnel.
- Outstanding reputation for quality and service.

pritchard brown

Baltimore, MD 800.231.2258 Fax 410.483.5695
info@pritchardbrown.com www.pritchardbrown.com

New EGSA Members

CMZ Services, Inc. (DD)

Acworth, GA
(770) 926-4473 Fax: (770) 926-3260
Contact: Robert Arsenault, Technician
Business: Service/Repair/Warranty/Installation of gensets and switchgear. Guardian, Generac, Onan, Cummins, Kohler, Pramac, Briggs & Stratton, Winco dealer.

Electro-Mechanical Svcs. Inc.. (DD)

Cocoa, FL
(321) 639-0500 Fax: (321) 632-3410
Contact: Larry G. Kerwood, President
Business: Emergency, Prime Power, Stand-By Generators maintenance & repair, engine rebuilding, generator rewinding, balancing rotors. We sell Winco, Tradewinds, Gillette, Baldor, Coleman, Marathon and Stanford Newage.

Fuel Purification, LLC. (MF)

Richmond, VA
(804) 358-0125
Contact: Tom Crowell, President
Business: We manufacture self-contained fuel quality maintenance systems for bulk stored diesel and bio diesel fuels. Our systems effectively remove water and solids to 2 microns insuring the availability of clean, dry, contaminant free fuel for standby diesel generators.

Governor Control Systems, Inc. . . . (DD)

Fort Lauderdale, FL
(954) 462-7404 Fax: (954) 761-8768
Contact: Lynn Bell, Marketing Manager
Business: Authorized sales, service and engineering center specializing in Woodward power management controls products, service and engineered solutions for the power generation market. Products include genset controls, protection, switchgear controls, load/VAR sharing, synchronizers, transducers and communication via HMI, SCADA. Authorized sales and service for Schaller Visatron Oil Mist Detection Systems, TDI Air Starters and Dynalco Instrumentation. GCS specialized in innovative, custom engineered control system modernizations and installations.

Jpex Engine Service, Inc.. (AE)

Dade City, FL
(813) 244-8128
Contact: Patrick Jones, President
Business: Jpex Engine Service, Inc. is a maintenance and repair service provider for diesel and gasoline driven on site generators and diesel fire pump drivers. We provide scheduled maintenance inspections through complete engine overhauls. Our specialty is the generator set up to the transfer switch.

K-Power Service. (CI)

Gauteng, South Africa
27 (0) 835604150 Fax: 27 (0) 866847401
Contact: PJ Ferreira
Business: K-Power Service primary business is the design and integration of control systems for new and old Diesel Power stations. Our specialties are synchronizing of multiple diesel generators. Since 1999 we have successfully installed and maintained large diesel power stations in Africa.

Lucho's Garage Services (AE)

Miami, FL
(509) 355-4600
Contact: Luis Paredes, Owner
Business: Preventive and corrective maintenance for generator sets, selection and installation of inverters, preventive and corrective maintenance to selected vehicles.

Megawatt Machine Services, LLC . . (MF)

Somerset, NJ
(732) 805-4000 Fax: (732) 805-4020
Contact: Pauline Balogh, President
Business: Megawatt Machine Services specializes in refurbishing and manufacturing replacement severe service control-valve trim with upgrades such as Stellite-overlay, hard surfacing, heat-treating and nitriding. OEM alternative source to: Fisher, CCI, BTG, Copes-Vulcan, Valtek, Masoneilan, Yarway, Atwood-Morrill, Sulzer, GE, Siemens-Westinghouse, Alstom, etc.

Ohio CAT (DD)

Cleveland, OH
(800) 637-5000 Fax: (440) 526-4609
Contact: Kraig Kirby, Electric Power Sales Mgr
Business: Caterpillar engine dealer; electric power generation, diesel/gaseous; Industrial; marine/propulsion/marine genset; rental gensets, distribution equipment and temperature control equipment. Caterpillar switchgear, transfer switches and UPS.

RK Manufacturing, LLC (MF)

Springboro, OH
(513) 897-1022 Fax: (513) 897-1023
Contact: Gary Kercher, CEO
Business: Manufacturer of custom enclosures, sound attenuated trailers for mobile, standby, rental fleets. All UL 142 fuel storage tanks. Enclosures of all types, aluminum, stainless steel

James Robinson (AF)

Apple River, IL
(815) 541-9338
Contact: James Robinson, Student
Business: I will attend Penn College beginning in the Fall of 2008. I am enrolled in the Associates Electrical Generation program. My graduation date is Spring of 2010.

William Robinson (AD)

Apple River, IL
(815) 541-9338
Contact: Robby Robinson, Technician
Business: Operate emergency generators for Illinois Dept. of Transportation - state tollways. Interested in certification.

Shank Power Products. (MR)

West St. Paul, MN
(651) 455-1241 Fax: (651) 455-1392
Contact: Kurt W. Stuebs, Vice President
Business: Manufacturer Rep firm supplying technical services and products to the power generation and OEM off-highway equipment markets. Products include exhaust silencers, emissions controls, thermal insulation blankets, rubber products, electronic gauges and displays, radiators and heat exchangers.

Statewide Commercial Electric (CI)

Anchorage, AK
(907) 562-3344 Fax: (907) 562-9044
Contact: John T Harpole, Service Mgr.
Business: We service and install power generation systems; we buy equipment from distributors and sell it to our end-user customers per the customer's specifications.

Tower One International (DD)

Houston, TX
(713) 862-0091 Fax: (713) 862-0092
Contact: Steve Bethel, Vice President
Business: Distributor for Lynx Power Systems, Atlanta, GA. Will provide maintenance, sales and installation services as well as rentals.

Univ. of Alaska Anchorage (AG)

Anchorage, AK
(907) 786-1485 Fax: (907) 786-4637
Contact: Kelly Smith, Director, Transportation & Power
Business: The Univ. of Alaska Anchorage offers degree, certificate, occupational endorsement and professional development programs and courses. On-site power generation fits within our heavy-duty diesel certificate and degree programs.

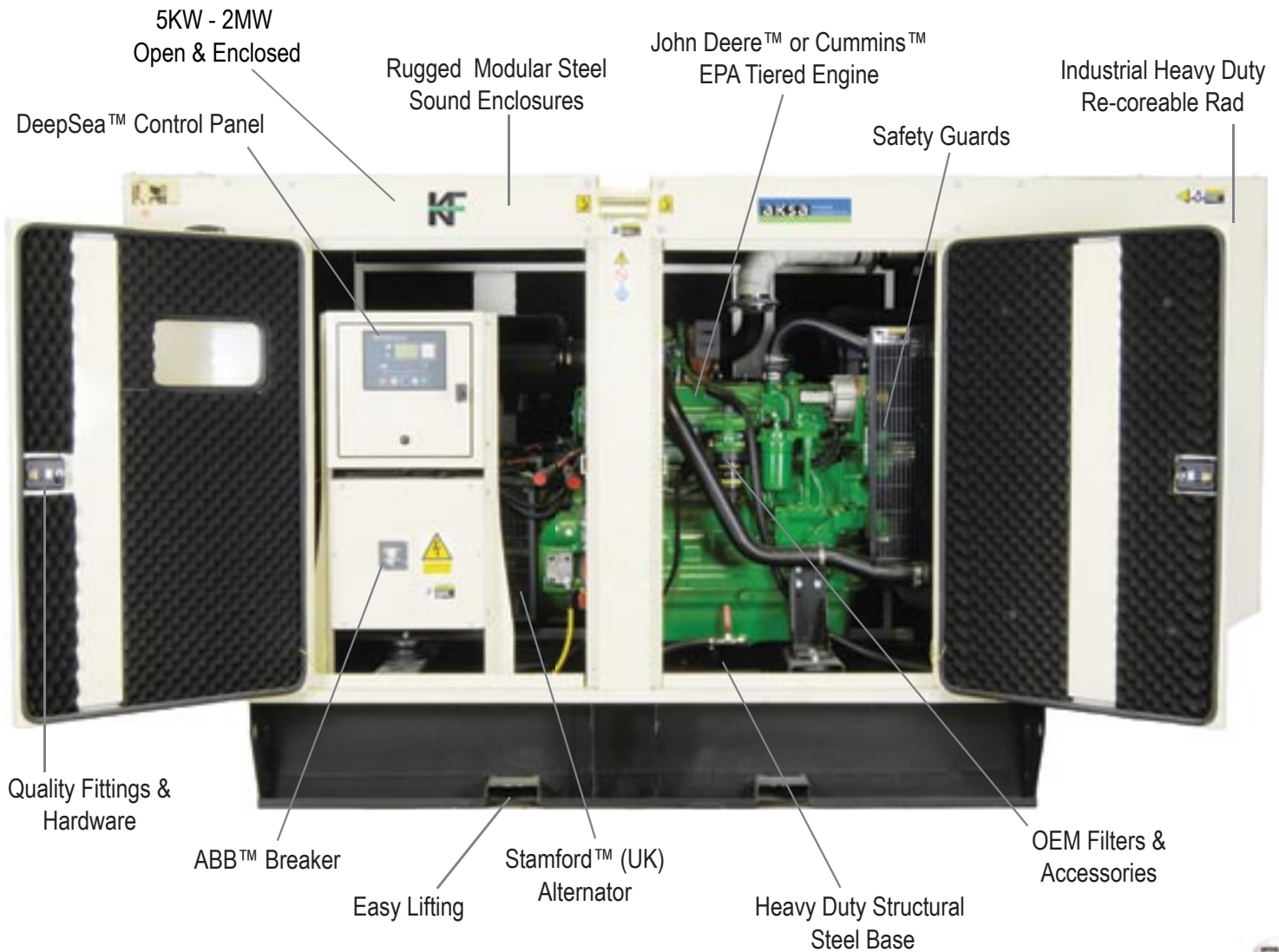
The York Water Company. (AD)

York, PA
(717) 718-2961 Fax: (717) 843-2715
Contact: John H. Strine, Operations Mgr.
Business: Incorporated in 1816, York Water Co. is the nation's oldest investor owned water utility. We supply public drinking water to 56,000 customers in York and Adams Counties in south central PA and have several MW of backup diesel generation and diesel engines as prime movers in pumping operations.

skep•tic /'sceptik'/ {Brit. scep•tic} *n.*
1 person inclined to doubt accepted opinions

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